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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/414,526	10/08/1999	YEONG-KWAN KIM	SEC.637	3413

7590 05/31/2002

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EXAMINER

CLEVELAND, MICHAEL B

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 05/31/2002

21

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/414,526

Applicant(s)

KIM ET AL. 59

Examiner

Michael Cleveland

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-26 is/are pending in the application.
- 4a) Of the above claim(s) 20 and 26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-19 and 21-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8. 6) ☐ Other: _____

DETAILED ACTION

Election/Restriction

1. Newly submitted claims 20 and 26 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: They are directed to the non-elected species of composite oxides.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 20-26 withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 15-18 and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (Appl. Phys. Lett., 71, pp. 3604-3606, hereafter Kim) in view of Marcus et al. (U.S. Patent 5,169,579, hereafter '579) and Marcus et al. (U.S. Patent 6,077,751, hereafter '751).

Claims 15, 17-18, 25: Kim teaches loading a silicon substrate into a reaction chamber, cleaning to uniformly terminate the surface with atomic hydrogen, dosing with TMA, which inherently chemisorbs to the surface, purging with TMA, which inherently removes any physisorbed TMA, and injecting water to react with the TMA to form an alumina film (p. 3604).

Kim does not teach uniformly terminating the surface bonds with oxygen atoms.

'579 teaches that a surface may be prepared for subsequent film growth (See col. 3, lines 39-68) by modifying the surface to terminate in bonds to either hydrogen or oxygen (col. 7, lines 23-39). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have initially uniformly terminated the surface of the silicon substrate of Kim with oxygen instead of hydrogen with the expectation of similar results. '579 teaches that the oxygen-terminated surface may be achieved by exposure to oxygen, but does not explicitly

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state that the surface is flushed with oxygen. However, '751 teaches that a silicon surface may be oxidized (i.e., terminated with oxygen atoms) by treating with oxygen (col. 4, lines 46-62). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have providing the oxygen to terminate the surface by flushing with oxygen as described in '751 with a reasonable expectation of success. Such oxygen must inherently be part of the ALE-formed film.

Claim 16: The purging steps inherently remove physisorbed material. (Applicant recognizes that the feature achieved by purging, for instance, at p. 11, lines 6-11).

Claim 21: Kim teaches that the substrate may be cleaned of a native oxide before being loaded into the chamber, but does not explicitly state that the cleaning step comes before loading the substrate into the chamber. However, it appears that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the cleaning step before loading the substrate into the ALD chamber in order to avoid damage to and contaminants in the ALD chamber by the HF used in the cleaning process.

Claim 22-23: A final purge inherently removes the by-products and any intermediates of the reaction (p. 3604, col. 2). Methane (CH₄) is a by-product of the reaction (p. 3604, col. 1).

Claim 24: The step of introducing oxygen must occur for finite period of time, and therefore that period can be subdivided into the first half of the time, during which oxygen is introduced the first time, and the second half of the time, during which oxygen is introduced a second time.

4. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of '579 and '751 as applied to claim 15 above, and further in view of Comizzoli et al. (U.S. Patent 5,851,849).

Kim, '579, and '751 suggest the formation of an alumina film by ALE, but do not explicitly teach the formation of other oxide films.

'849 teaches that other oxide films than alumina, such as TiO₂, may be formed by ALE using other metal precursors (col. 7, lines 1-42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the method of Kim, '579, and '751 to have formed a film of a different metal oxide, such as titania with a reasonable expectation of success because '849 teaches that the process can be adapted to other metal oxides, and indicates that those metal oxides are of interest as passivating films.

Response to Arguments

5. Applicant's arguments filed 8/27/01 have been fully considered but they are not persuasive.

The rejections under 35 USC 112 and the rejection under 35 USC 102 in view of Comizzoli are withdrawn in view of the amendments.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues that it is not apparent to them how to etch the surface to produce an oxygen-terminated surface. The argument is not convincing because the references taken as a whole suggest that instead of using the process of Kim to terminate with hydrogen, one could have used the process of H. Marcus '579 and S. Marcus '751 to terminate with oxygen instead. Applicant argues that the claims are patentable because of the new limitation which requires that the terminating atom be a major component of the film. The new limitation results in the withdrawing of the rejections under 35 USC 102(e) of claims 7 and 11 over '849.

Applicant argues that Kim provides no motivation to deposit an initial nucleation promoter. The argument is unconvincing because the motivation is provided by Marcus '579 itself, as aiding in the growth of films, such as Al_2O_3 , the film of Kim, on silicon substrates.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

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CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (703) 308-2331. The examiner can normally be reached on 9-5:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 306-3186 for regular communications and (703) 306-3186 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MBC

MBC

May 30, 2002



SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
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